

Further observations on *Ideoblothrus* (Pseudoscorpiones: Syarinidae) from subterranean environments in Australia

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Abstract – *Ideoblothrus linnaci* sp. nov. is described from subterranean environments in the Pilbara region of Western Australia. The tritonymph of *Ideoblothrus* sp. from Mesa A, previously known from a single deutonymph, is briefly described and illustrated. The tritonymph of a previously unrecognized species, *Ideoblothrus* sp. from the Ord Ranges, is also briefly described and illustrated. Both of these species are not named due to lack of adult specimens.

INTRODUCTION

A recent study into the taxonomy of some Australian members of the genus *Ideoblothrus* Balzan 1892 revealed five species restricted to subterranean habitats within the Pilbara region of Western Australia, *I. papillon* Harvey 1991, *I. woodi* Harvey, *I. pisolithus* Harvey and Edward 2007, *I. westi* Harvey and Edward 2007 and *I. nesotymbus* Harvey and Edward (Harvey 1991; Harvey and Edward 2007), and two found in rainforest vine thickets in tropical northern Australia, *I. descartes* Harvey and Edward 2007 and *I. milikapiti* Harvey and Edward 2007 (Harvey and Edward 2007). The subterranean fauna of the Pilbara region is thought to have been derived from epigeal ancestral stock which could no longer survive in surface environments due to the ongoing aridification processes gradually restricting the terrestrial habitat available to rainforest organisms (Humphreys 1993, 2000, 2001). Within Australia, species of *Ideoblothrus* are otherwise known only from rainforest habitats in the northern regions of the continent (Harvey and Edward 2007). Since completion of the research published by Harvey and Edward (2007), further specimens of *Ideoblothrus* have been submitted to the Western Australian Museum for identification, and two have been found to represent additional new species. These specimens are described in the present paper to more fully document the subterranean fauna of the region. One, represented by an adult male, is described and named. Two others are tritonymphs of a species previously known as *Ideoblothrus* sp. Mesa A (Harvey and Edward 2007), and the fourth is a tritonymph from the Ord Ranges that differs in morphology to all other named species. The Ord Ranges species is not named due to the lack of adult specimens.

MATERIALS AND METHODS

The specimens examined in the present study are lodged in the Western Australian Museum, Perth (WAM). They were collected with the use of traps ("habitat trap" or "troglofauna trap") filled with sterilized and moistened leaf litter suspended in wire baskets, which were suspended within bore holes. Upon removal of the traps, the litter was searched for macroscopic organisms which were preserved in ethanol.

Terminology and mensuration largely follows Chamberlin (1931), with the exception of the nomenclature of the chelicera (Judson 2007), pedipalps, legs and with some minor modifications to the terminology of the trichobothria (Harvey 1992). In particular, it should be noted that the terminology for the trichobothria used by Harvey (1992) differs slightly from that used by other workers.

The specimens were examined with an Olympus BH-2 compound microscope and illustrated with the aid of a drawing tube. Measurements were taken at the highest possible magnification using an ocular graticule, and are all in millimetres. The specimens were examined by preparing temporary slide mounts by immersing the specimen in 20% lactic acid at room temperature for several days, and mounting them on microscope slides with 10 or 12 mm coverslips supported by small sections of 0.25 mm or 0.50 mm diameter nylon fishing line. After study the specimens were returned to 75% ethanol with the dissected portions placed in 12 x 3 mm glass genitalia microvials (BioQuip Products, Inc.). Images of the whole animal were taken using a Leica DFC 500 digital camera mounted on a Leica MZ16 microscope.

Family Syarinidae Chamberlin 1930

Genus *Ideoblothrus* Balzan 1892

Ideobisium (*Ideoblothrus*) Balzan 1892: 541.

Pachychitra Chamberlin 1938: 111.

Ideoblothrus Balzan: Muchmore 1982: 207.

Type species

Ideobisium (*Ideoblothrus*): *Ideobisium* (*Ideoblothrus*) *similis* Balzan, 1892, by subsequent designation of Muchmore (1982).

Pachychitra: *Pachychitra maya* Chamberlin 1938, by original designation.

Diagnosis

See Harvey and Edward (2007).

Ideoblothrus linnaei sp. nov.

Figures 1–6

Material examined

Holotype

Australia: Western Australia: ♂, Mesa A, approximately 50 km west of Pannawonica, site MEARC4316 P6 T1-2, 21°40'26"S, 115°52'12"E, 23 May 2007, habitat trap, J. Adcroft, D. Kamien (WAM T81373).

Diagnosis

Ideoblothrus linnaei is one of the smallest Australian species of the genus [e.g. male chela (with pedicel) length 0.454 mm], and is only larger than *I. milikapiti* from a rainforest habitat in the Northern Territory [e.g. chela (with pedicel) length of male 0.371–0.381 mm]. They differ by the shape of the chelal hand which is cylindrical in *I. linnaei* (Figure 3) but laterally broadened in *I. milikapiti* (Harvey and Edward 2007, figure 43), and the placement of trichobothria *st* and *t*, which are clearly separated in *I. linnaei* (Figure 5) but are contiguous in *I. milikapiti* (Harvey and Edward 2007, figure 44).

Description

Adult male

Colour: carapace and pedipalps pale reddish brown, abdomen and legs pale tan (Figure 1).

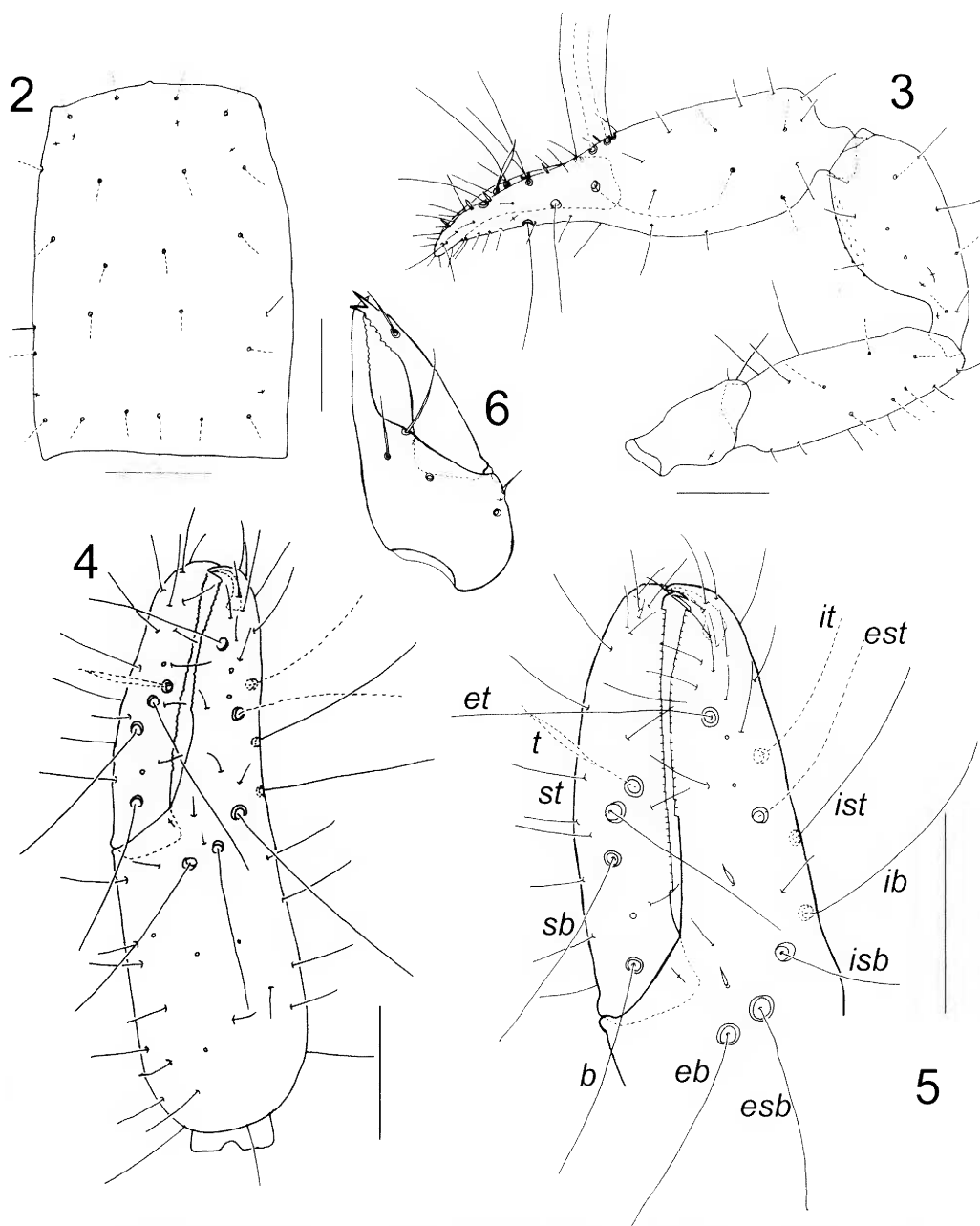
Chelicera: 5 setae on hand (Figure 6), all setae acuminate, *is*, *ls*, *sbs*, and *bs* long, *es* very short; movable finger with 1 sub-distal seta; fixed finger with ca. 9 small teeth; movable finger with ca. 7 small teeth; with 2 dorsal lyrifissures and 1 ventral lyrifissure; galea straight, extending to tip of finger; rallum of 5 blades, distal blade broadened and finely denticulate; serrula exterior with 20 blades.



Figure 1 *Ideoblothrus linnaei* sp. nov., holotype male (WAM T81373).

Pedipalp: internal margin of patella very finely granulate, of trochanter, femur, and chela smooth; setae on internal margins generally very long and acicular; trochanter without tubercles; trochanter 1.06, femur 2.86, patella 2.12, chela (with pedicel) 3.55, chela (without pedicel) 3.30, hand 1.80 times longer than broad; movable finger 0.86 times longer than hand (without pedicel). Femur without tactile setae; without basal projection. Patella with 3 lyrifissures situated dorsally near pedicel (Figure 3). Fixed chelal finger with eight trichobothria, movable chelal finger with four trichobothria (Figures 4, 5): *eb* and *esb* at base of finger, *isb* situated near *ib*; *est* situated near *ist*; *it* distal to *est*; *et* sub-distal; microsetae (chemosensory setae) absent on both fingers; trichobothria *b* of movable finger situated basally; *sb*, *st*, and *t* situated medially, close to each other; *t* slightly shortened, lanceolate, and bent backward. Venom apparatus present only in fixed chelal finger, venom duct very short, nodus ramosus inflated. Chelal teeth of both fingers (Figure 5) obtuse; fixed finger with 25 teeth; movable finger with 37 teeth; accessory teeth absent. External and internal chelal condyles small and rounded.

Cephalothorax: carapace (Figure 2) 1.42 times longer than broad; sub-rectangular; without any



Figures 2-6 *Ideoblothrus limaci*, sp. nov., holotype male (WAM T81373): 2, carapace; 3, right pedipalp, dorsal; 4, left chela, lateral; 5, left chelal fingers, lateral; 6, right chelicera, dorsal. Scale lines = 0.1 mm (Figures 2-5), 0.5 mm (Figure 6).

traces of eyes; epistome present, small; with 24 setae arranged 4: 4: 4: 6: 6; without furrows; with 3 pairs of small lyrifissures, first and second pairs placed near anterior margin, third pair placed sub-medially, near setae on posterior row. Manducatory process with one long distal and one long sub-distal seta, without sub-oral seta; remainder of maxilla with 7 setae. Chaetotaxy of coxae I–IV: 5: 3: 3: 4. Posterior section of coxae II slightly overlapping anterior section of coxae III.

Abdomen: pleural membrane granulo-striate near cephalothorax, remainder longitudinally striate, without setae. Tergites and sternites undivided. Tergal chaetotaxy: 6: 7: 9: 8: 9: 9: 8: 8: 7: 6: 1; setae uniseriate and acuminate. Sternal chaetotaxy: 7: (2) 6 [3+3] (2): (2) 8 (2): 10: 11: 9: 10: 10: 8: 4: 2; setae on sternite II small; setae uniseriate and acuminate; without median glandular setae; anus not surrounded by sternite XI.

Genitalia: male genitalia with small rounded ejaculatory canal atrium; moderately sized lateral genital sacs and an undivided, enlarged median genital sac; male internal genital setae arranged in two triangular groups of three; a pair of setae flanking an anteromedian notch of the posterior genital operculum.

Legs: femora I and II longer than patellae I and II; femora I and II with one transverse lyrifissure situated sub-distally; femur + patella of leg IV 3.03 times longer than broad; legs III and IV with articulation between femur and patella segments slightly oblique; tibiae III and IV with medial tactile seta; metatarsi III and IV with sub-basal tactile seta; diplotarsate, all legs with tarsus longer than metatarsus; subterminal tarsal setae distally serrate; arolia same length as claws, not divided; claws simple.

Dimensions, holotype: body length 1.16. Pedipalps: trochanter 0.074/0.070, femur 0.237/0.083, patella 0.237/0.112, chela (with pedicel) 0.454/0.128, chela (without pedicel) 0.422/0.128, hand (without pedicel) length 0.230 movable finger length 0.198. Chelicera 0.067/0.080, movable finger length 0.118. Carapace 0.346/0.243. Leg I: femur 0.042/0.026, patella 0.032/0.024, tibia 0.059/0.019, metatarsus 0.021/0.015, tarsus 0.040/0.013. Leg IV: femur + patella 0.100/0.033, tibia 0.072/0.012, meta-tarsus 0.024/0.17, tarsus 0.040/0.014.

Remarks

Ideoblothrus linnaei has only been found within an iron-bearing pisolite mesa, approximately 573 ha in area, in the Pannawonica region of Western Australia. It co-occurs with *Ideoblothrus* sp. Mesa A, also found within Mesa A, but differs by its much smaller size.

Etymology

This species is named for Carolus Linnaeus (1707–1778), founder of the modern system of taxonomy, to mark the 250th anniversary of the publication of the 10th edition of *Systema Naturae* (Linnaeus 1758).

Ideoblothrus sp. Mesa A

Figure 7

Material Examined

Australia: Western Australia: 1 tritonymph, approximately 50 km W. of Pannawonica, 21°41'09"S, 115°52'25"E, 23 March 2007, J. Adcroft, D. Kamien (WAM T81374); 1 tritonymph, Mesa A, near Pannawonica, borehole MEA 2988 P5 T2-2, 21°40'10"S, 115°52'43"E, 6 February 2007, D. Kamien (WAM T81479).

Description

Tritonymph

Colour: generally pale, pedipalps and chelicera pale yellow-orange.

Chelicera: with five setae on hand, all setae acuminate; movable finger one sub-distal seta.

Pedipalp: femur 3.14, patella 1.67, chela (with pedicel) 3.29, chela (without pedicel) 2.91, hand 1.91 times longer than broad, movable finger 1.45 times longer than hand. Fixed chelal finger with 7 trichobothria, movable chelal finger with 3 trichobothria (Figure 7): *isb* and *sb* absent; *eb* and *esb* situated at base of fixed finger; *ib* situated on dorso-distal surface of hand; *est*, *ist* and *it* situated close together; *et* situated sub-distally; *b* situated sub-basally; *st* and *t* situated sub-medially; *t* lanceolate. Venom apparatus only present in fixed chelal finger. Chelal teeth: fixed finger with 36 rounded teeth; movable finger with 45 rounded teeth.

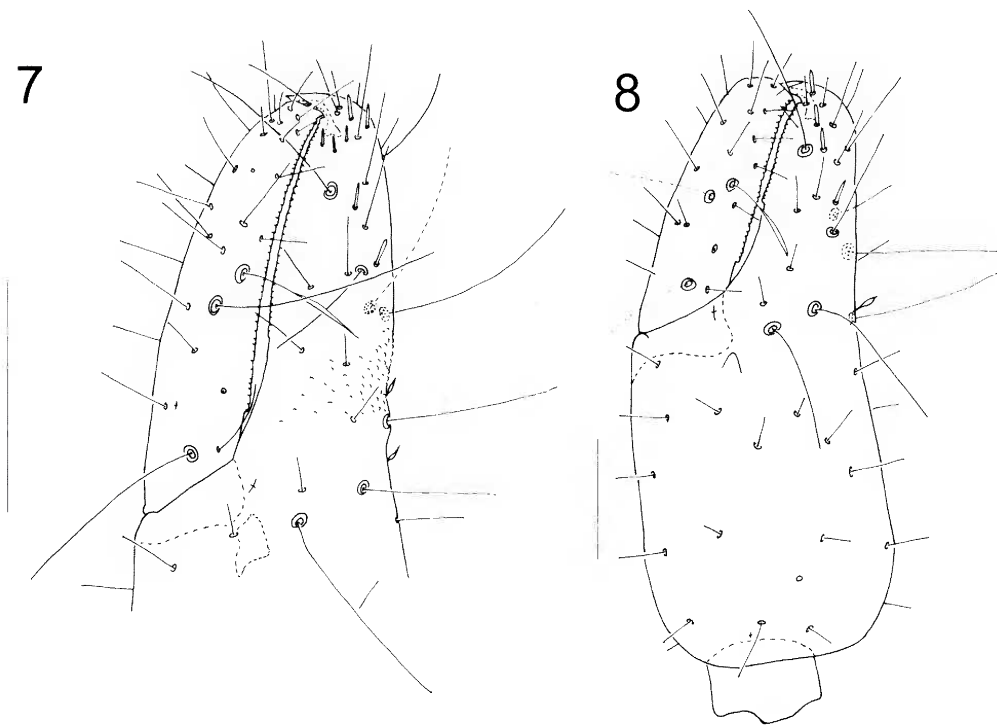
Cephalothorax: carapace 1.16 times longer than broad; without eyes; with 21 setae, arranged 4: 4: 3: 4: 6.

Abdomen: pleural membrane granulo-striate near cephalothorax, remainder longitudinally striate, without setae. Tergites and sternites undivided.

Dimensions, WAM T81374: carapace 0.429/0.499. Chelicera 0.128/0.134, movable finger 0.198. Pedipalps: trochanter 0.150/0.094, femur 0.496/0.158, patella 0.400/0.240, chela (with pedicel) 0.797/0.242, chela (without pedicel) 0.704, hand (without pedicel) length 0.463, movable finger length 0.320.

Ideoblothrus sp. Ord Ranges

Figure 8



Figures 7–8 7, *Idcoblothrus* sp. Mesa A, tritonymph (WAM T81374), left chela, lateral; 8, *Idcoblothrus* sp. Ord Ranges, tritonymph (WAM T81481), left chela, lateral. Scale lines = 0.2 mm (Figure 7), 0.5 mm (Figure 8).

Material examined

Australia: Western Australia: 1 tritonymph, Ord Ranges, drill hole PDRC 098, troglotauna trap, 20°20'13.5"S, 119°08'27.5"E, 22 March 2007, S.M. Eberhard (WAM T81481).

Description

Tritonymph

Colour: carapace and pedipalps brownish-red, abdomen and legs pale tan.

Chelicera: with five setae on hand, all setae acuminate; movable finger with one sub-distal seta; rallum of 5 blades, distal blade broadened and finely denticulate; serrula exterior with ca 24 blades.

Pedipalp: trochanter 1.71, femur 2.34, patella 1.26, chela (with pedicel) 2.94, chela (without pedicel) 2.69, hand 1.59 times longer than broad; movable finger 1.12 times longer than hand. Fixed chelal finger with 7 trichobothria (Figure 8): *isb* and *st* absent; *eb* and *esb* situated at base of fixed finger; *ib* situated on dorso-distal surface of hand; *est*, *ist* and *it* situated close together; *et* situated sub-distally; *b* situated sub-basally; *st* and *t* situated sub-medially; *t* lanceolate. Venom apparatus only

present in fixed chelal finger. Chelal teeth: fixed finger with 22 rounded teeth, movable finger with 30 rounded teeth.

Cephalothorax: carapace 1.20 times longer than broad; without eyes; with 25 setae, arranged 4: 4: 4: 4: 4.

Abdomen: pleural membrane granulo-striate near cephalothorax, remainder longitudinally striate, without setae. Tergites and sternites undivided.

Dimensions, WAM T81481: carapace 0.422/0.362. Chelicera 0.115/0.096, movable finger 0.147. Pedipalps: trochanter 0.154/0.090, femur 0.281/0.120, patella 0.218/0.173, chela (with pedicel) 0.582/0.198, chela (without pedicel) 0.532, hand (without pedicel) length 0.312, movable finger length 0.281.

Remarks

The single tritonymph from the Ord Ranges represents a previously undescribed species which is not named here due to the lack of adult specimens. It differs from previously named Australian species by the robust pedipalpal chela [e.g. chela (with pedicel) 2.94 times longer than broad].

ACKNOWLEDGEMENTS

This study was funded by Robe River Iron Associates and Chevron Australia Pty Ltd, and was kindly facilitated by Garth Humphreys of Biota Environmental Sciences. We wish to thank Garth Humphreys and Stefan Eberhard for supplying us with the specimens that formed the basis for this study. Volker Mahnert, Paul Doughty, Bill Humphreys and an anonymous referee provided very helpful comments on a draft of the manuscript.

REFERENCES

- Balzan, L. (1892). Voyage de M. E. Simon au Venezuela (Décembre 1887 – Avril 1888). Arachnides. Chernetes (Pseudoscorpiones). *Annales de la Société Entomologique de France* **60**: 497–552.
- Chamberlin, J.C. (1931). The arachnid order Chelonethida. *Stanford University Publications, Biological Sciences* **7**(1): 1–284.
- Chamberlin, J.C. (1938). A new genus and three new species of false scorpion from Yucatan Caves (Arachnida – Chelonethida). *Publications of the Carnegie Institution of Washington* **491**: 109–121.
- Harvey, M.S. (1991). The cavernicolous pseudoscorpions (Chelicerata: Pseudoscorpionida) of Cape Range, Western Australia. *Records of the Western Australian Museum* **15**: 487–502.
- Harvey, M.S. (1992). The phylogeny and classification of the Pseudoscorpionida (Chelicerata: Arachnida). *Invertebrate Taxonomy* **6**: 1373–1435.
- Harvey, M.S. and Edward, K.L. (2007). A review of the pseudoscorpion genus *Ideoblothrus* (Pseudoscorpiones, Syarinidae) from western and northern Australia. *Journal of Natural History* **41**: 445–472.
- Humphreys, W.F. (1993). The significance of the subterranean fauna in biogeographical reconstruction: examples from Cape Range peninsula, Western Australia. *Records of the Western Australian Museum, Supplement* **45**: 165–192.
- Humphreys, W.F. (2000). The hypogean fauna of the Cape Range Peninsula and Barrow Island, northwestern Australia. In: Wilkens, H., Culver, D.C. and Humphreys, W.F. (eds), *Subterranean ecosystems*: 581–601. Elsevier: Amsterdam.
- Humphreys, W.F. (2001). The subterranean fauna of Barrow Island, northwestern Australia, and its environment. *Mémoires de Biospéologie* **28**: 107–127.
- Judson, M.L.I. (2007). A new and endangered species of the pseudoscorpion genus *Lagynochthonius* from a cave in Vietnam, with notes on chelal morphology and the composition of the Tyrannochthoniini (Arachnida, Chelonethi, Chthoniidae). *Zootaxa* **1627**: 53–68.
- Linnaeus, C. (1758). *Systema Naturae*, 10th edition. Vol. 1. L. Salvii: Holmiae.
- Muchmore, W.B. (1982). The genera *Ideobisium* and *Ideoblothrus*, with remarks on the family Syarinidae (Pseudoscorpionida). *Journal of Arachnology* **10**: 193–221.

Manuscript received 15 February 2008; accepted 27 May 2008.